

01-SM5-313
(ATI-0016)

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IN THE CLAIMS

1. (Previously Presented) A drying process for removing contaminants from a substrate having a cured low k dielectric layer thereon in a process chamber, the process comprising:

removing air from the process chamber prior to exposure of the low k dielectric layer to photons;

exposing the low k dielectric layer to the photons of a broadband spectrum having wavelengths of about 150 nm to about 500 nm and effecting excitation, scission and/or fragmentation of contaminants contained within the low k dielectric layer; and

simultaneously with, prior to, or subsequent to the photon exposure, exposing the substrate to a process effective to remove the contaminants without causing degradation of the low k dielectric layer, wherein the process is an oxygen free plasma process or a combination of the oxygen free plasma process and at least one of a heat process and a vacuum process.

2. (Currently amended) The drying process of Claim 1, wherein the photons are generated by ultraviolet light radiation ~~or x-ray radiation~~.

3. (Previously Presented) The drying process of Claim 1, wherein the low k dielectric layer comprises a porous or non-porous doped oxide material, and wherein the heat process comprises heating the substrate to a temperature of about 20°C to about 400°C.

4. (Canceled)

5. (Previously Presented) The drying process of Claim 1, wherein the low k dielectric layer comprises an organic material, and wherein the heat process comprises heating the substrate to a temperature of about 80°C to about 180°C.

(Original) The drying process of Claim 1, wherein the photons incident to the substrate have an energy density of about 10 milliwatts per square centimeter to about 1 watt per square centimeter.

7. (Previously Presented) The drying process of Claim 1, wherein the vacuum process comprises maintaining a chamber pressure below about 1 to 100 milliTorr.

8. (Original) The drying process of Claim 1, further comprising purging the process chamber with an inert gas.

9. (Previously Presented) A process for removing contaminants adsorbed, adhered, or trapped to or within a cured low k dielectric layer, wherein the contaminants comprise residual water, moisture, silanols, residual plasma or wet etch chemistries residuals of wet clean chemistries, acids, bases, and solvents, the process comprising:

placing a substrate comprising the low k dielectric layer into a process chamber and removing air from the process chamber prior to exposure of the low k dielectric layer to radiation of a broadband spectrum comprising a wavelength of about 150 nanometers to about 500 nanometers;

exposing the low k dielectric layer in the process chamber to the radiation; and

exposing the substrate to an oxygen free plasma or a combination of the oxygen free plasma and at least one of a heat process or vacuum process to remove the contaminants without causing degradation of the low k dielectric layer.

10. (Previously Presented) The process of Claim 9, wherein the low k dielectric layer comprises a porous material or doped oxide material, and wherein exposing the substrate to the heat process comprises heating the substrate to a temperature of about 20°C to about 400°C.

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11. (Canceled)
12. (Previously Presented) The process of Claim 9, wherein the low k dielectric layer comprises an organic material, and wherein exposing the substrate to the heat process comprises heating the substrate to a temperature of about 80°C to about 180°C.
13. (Previously Presented) The process of Claim 9, wherein exposing the substrate to the vacuum process comprises lowering a pressure in the process chamber to less than about 1 to about 100 milliTorr.
14. (Original) The process of Claim 9, wherein exposing the low k dielectric layer to the radiation comprises a time of less than about 120 seconds.
15. (Original) The process of Claim 9, wherein exposing the low k dielectric layer to the radiation comprises a time of less than about 60 seconds.
16. (Original) The process of Claim 9, wherein the plasma is formed from a gas composition comprising a hydrogen bearing gas and an inert gas.

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17. (Previously Presented) A drying process for removing contaminants from a substrate having a cured low k dielectric layer thereon in a process chamber, the process comprising:

removing air from the process chamber prior to exposing the low k dielectric layer to electromagnetic radiation;

exposing the low k dielectric layer to the electromagnetic radiation having wavelengths of a broadband spectrum of about 150nm to about 500nm and effecting excitation, scission and/or fragmentation of contaminants contained within the low k dielectric layer; and

simultaneously with, prior to, or subsequent to the radiation exposure, exposing the substrate to a process effective to remove the contaminants without causing degradation of the low k dielectric layer, wherein the process is an oxygen free plasma process, or combinations of the oxygen free plasma process with at least one of a heat process and a vacuum process.

18. (Previously Presented) The process of Claim 1, wherein removing the air from the process chamber comprises purging the chamber with an inert gas.

19. (Previously Presented) The process of Claim 7, wherein removing the air from the process chamber comprises purging the chamber with an inert gas.

20. (Previously Presented) The process of Claim 17, wherein removing the air from the process chamber comprises purging the chamber with an inert gas.